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PERSONAL HYGIENE  
CONCERNS IN LONG TERM  
SPACE FLIGHT

NAS 9-12866

**FAIRCHILD**

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SECTION I  
INTRODUCTION

This report is in fulfillment of Contract NAS9-12866, the Manned Space Center, NASA, Houston, Texas. Mr. R. L. Sauer was the contract monitor for this program.

In a previous study by Fairchild Republic for the MSC NASA, NAS9-11509, it was realized that much of the personal hygiene concern would center around the individual's preferences and personal fastidiousness. As regards personal hygiene per se, the problem is two pronged. First, there is the hardware and logistics involved in keeping clean. Second, there is the psychological acceptance of this, engendered by the personal attitude of the crewman and the mission importance. It becomes obvious that in order to minimize the personality quirks and strictly subjective feelings of the individual, he must be provided with as normal a situation for his ablutions as is feasible. The extent to which this is done is truly the crux of the whole task. Is ultra sophistication required to compensate for the earlier somewhat primitive approaches? And if so, to what extent and with what effect on other systems?

In the earlier study, referenced above, certain baseline information was obtained to offer checks and balances to data sought from the Apollo series and the recent NASA Skylab Medical Experiments Altitude Test (SMEAT). The ideal situation would be to refine the data determinations with each new or additional input. This was to be one way of improving the state-of-the-art and aid in assembling an acceptable personal hygiene array.

Data was sought from all investigators on SMEAT whose experiments might add to the personal hygiene load. As of the preparation date of this report much of that data was still being analyzed by the investigators and was thus unavailable. The inclusion of the SMEAT subjects' comments was likewise sought and obtained to a limited degree.

A prior screening of available data was performed so as to categorize the impacted areas. The data handling approach deserves a few words. It was felt that the individual subject should be perused as a total picture as one scans an on-going experimental vehicle. That which he does or has done to him must be noted for relevancy to personal hygiene. For example, at time T what was his overall physical health,

his skin condition, exercise output, when did he wash last, how clean was the cabin (dust-bacteria-food debris), how clean were his clothes? These and other details were to be noted and so at a fixed time the individual's personal hygiene status could be described. With this recognition comes a better understanding of any potential hazard or problems apropos personal hygiene and the man's well being. This knowledge could supplement medical findings or indicate methodology apropos a sound personal hygiene environment.

The intent of this document is not to point a finger at negative findings, but rather to lead the way to a better approach based on those findings.

## SECTION II

### STUDY SCOPE AND OBJECTIVE

In the belief that any study of a personal hygiene nature must be broader in scope than just the individual's preferences a wider field was sought and planned for. Using in part the recent Skylab Medical Experiments Altitude Test an appraisal of impact areas as regards personal hygiene, logistical implications and reclamation of expendables were scheduled to be examined. To the limited extent that data was revealed by the investigators and data managers on SMEAT an evaluation was conducted to include waste management infringements, housekeeping requirements, shower water analysis and reclamation possibilities, expendable use rates and acceptability of personal hygiene equipment. Recognition was attempted of the environmental intrusions as regards microorganisms, dust and equipment derived lint. Fully aware of the 1-g nature of SMEAT the data provided has not been skewed to compensate for this. In the few instances where a data projection into a zero gravity configuration has been made it was based on previous zero gravity study extrapolations.

The recent Apollo flights have been analysed so as to provide the most recent flight comments apropos personal hygiene.

**SECTION III**  
**RELATIONSHIP TO OTHER NASA EFFORTS**

The obvious impacts of various programs are only appreciated when their events are tabulated as follows:

- A. Food Management**
  - 1. Preparation
  - 2. Dining
  - 3. Clean-up
  - 4. Waste disposal
- B. Waste Management**
  - 1. Urination
  - 2. Defecation
  - 3. Body clean-up
  - 4. Waste disposal
- C. Housekeeping**
  - 1. Removal of grease, dirt, etc., (atmospheric)
  - 2. Soiled surface clean-up
  - 3. Utensil or equipment clean-up
  - 4. Clean-up of medical debris or instruments
  - 5. Disposal of cleaning equipment

In all of these man is the interface. As such he is bound to get dirty and require a personal clean-up.

**SECTION IV**  
**METHOD OF APPROACH AND PRINCIPAL ASSUMPTIONS**

Data from the numerous experiments and the hardware inventories were sought to provide baseline information prior to scanning the study results and analysis. Interviews with principal investigators and data managers were attempted so as to be cognizant of data format, handling and experimental end points. Since much of the hardware or utensils for Skylab personal hygiene use was either in kit form or zero-gravity unique, little could be done to properly evaluate the utility and functionability except for subjective comments.

On the SMEAT program as a corollary to predicting the degree of man's involvement with personal hygiene needs, a tabulation was kept of such events as water intake, frequency of urination and defecation, accidents or events requiring clean-up, method of clean-up, microbiological environment and shower water contamination.

SECTION V  
DATA HANDLING AND INTERPRETATION

Recognizing that work performance in any fashion could in and of itself produce dirt as well as cause the astronaut to become dirty, we attempted to correlate SMEAT various work levels, as indicated in watts produced, with body weight loss and water intake with urine voids. This approach while not absolutely complementary did give a good picture of metabolic loading. The work efforts expended in conjunction with M171, M151 or M093 on SMEAT were not included in these tables. Originally, the following data callouts were requested to round out our interpretation of the factors we considered relevant to personal hygiene. These were:

M093 and M171 (Metabolic)	P7007	Ergometer Work Rate
	P7027	Body Temperature
	T7011	Ergometer RPM
	C7311	Ambient Temperature
M0133 (Sleep)	P7027	Body Temperature
	C7311	Ambient Temperature
M073 (Body Fluids)	C7311	Ambient Temperature
	P7027	Body Temperature
	Fluid Chemistry TOTAL	
	Bacteriology TOTAL	
M0151 (Time and Motion)	P7027	Body Temperature
	C7311	Ambient Temperature

The information that was made available has been incorporated into our analysis.

In previous meetings by the Skylab Microbial Contamination Control Intercenter Working Group (SMC CIWG), hereafter called the contamination control group, ratings were established to categorize areas of microbiological concern. The designations were as follows:

"High" - cleaning procedures must be outlined as a routine activity; cleaning agent would be provided and crew timeline will be allotted for this activity.

"Medium" - cleaning procedures should be outlined; a cleaning agent will be provided but procedures will be conducted only in event of a contingency.

"Low" - normal use will not present a contamination problem.



While recognizing no absolute values and accepting subjective opinions for these definitions it must be apparent that at any given time any region of the spacecraft could become a "high" region and so qualify for a thorough clean up. The recent SMEAT microbiological studies commented accurately on this possibility.

It was long supposed and recently demonstrated that in a zero-g habitat growth rates of microorganisms may be elevated. Brown<sup>1</sup> Additionally important is the realization that changed atmospheric regimes will adversely affect the oral population. Brown<sup>2</sup> points out the effect of atmospheric change as regards the presence of increased populations of anaerobes, bacterioides, neisseria and streptococci found in the mouth. On the recent SMEAT tests surface samples showed a definite trend towards an undesirable level. It was also indicated in this report that the skin flora seemed to be held in check. It was felt that although Staphylococcus epidermis was present in persistent pustules on the skin a stalemate was achieved. The presence on SMEAT of Beta hemolytic streptococci Non Group A on the skin would appear to imply a growth favorable site. It is a well known fact of skin ecology that the topical population can be temporarily removed only to be replaced by a less fastidious population. The disappearance of some gram negative enterics from the skin of one crewmember is used as an indicator of the efficiency of the personal hygiene regime. The underlying cause of this apparently favorable happenstance remains unclear. If the lack of some microbiological growth is the criteria for indicating a good cleaning procedure, how much more critical does a pattern of survivability become if selected organisms such as S. epidermis, Micrococcus spp., and Corynebacterium spp. continue to reproduce. Obviously, the counter arguments to the enteric organism's destruction mentioned earlier would have to recognize the shortcomings of the personal hygiene procedure and/or the beneficial effect (if present) of the particular environment.

Individual species of organisms can alter their chemistry to cope with almost any negative parameter. This is historically correct. In this regard the excessive numbers of bacteria recovered from swab, strip and air impaction samples indicate survivability of microorganisms well beyond that acceptable in a 1-g home environment. It would appear that the enclosed environment of a Skylab base could be reasonably expected to permit the survivability of many organisms in aerosol form. As such they are potential invaders of either the human host or hardware. If granted, a surface possessing the proper degree of moisture and nutritional factors such as body debris or food waste, a site could be activated and as Brown<sup>1</sup> had previously indicated an enhanced growth may be expected in zero-g. The frequent personal

contacts the crewman makes with surfaces common to all crewmen such as desk tops, work areas, instruments, body washing equipment and the act of urine/fecal discharge into a common toilet can be focal points for infection. As a matter of record on the SMEAT there were 1110 urine voids. The SMEAT microbiological review properly emphasizes the potential hazards from various organisms present on that study. For example, the Beta hemolytica Non-Group A can result in septicemia or meningitis while the *S. epidermis* are frequently cited in bacteremia and endocarditis. The results reported confirm adequately the earlier studies of Riely<sup>3</sup> which depicted the presence of *Corynebacteria* a possible pathogen to man (diphtheria) as a prime survivor of a space environment. The presence of *S. aureus* on the skin is unfortunately not a good sign of personal hygiene effectiveness. Healthy skin, under normal conditions has an amazing resistance to the continued growth of *S. aureus*. It is most difficult to produce growth even if desired<sup>4,5</sup>. Normal skin inhabitants such as *Staph. epidermidis* seem to over grow any *Staph. aureus*. In fact in one experiment it was necessary to degerm the skin with alcohol prior to inoculating with *S. aureus* to assure growth. Other investigators have stressed repeatedly the fact that lack of understanding of bacterial behavior in a weightless and enriched environment is only offset by the inability to comprehend the mechanisms of host resistance in a similar situation with reduced oxygen tension. A literature survey has indicated no discernible trend or rationale for certain events. Influenza virus has been both effective and ineffective in producing disease. The same can be said of *S. typhimurium* and of *K. pneumoniae* where time at altitude influenced the pathogenicity. *S. aureus* produced an increased number of skin lesions in a mouse study, but lacked lethality if injected intraperitoneal. Venezuelan equine encephalomyelitis (VEE) proved to be indeterminate in action as did a study with mengovirus. All in all, this remains a poorly defined area and, therefore, requires close observation and planning to protect space crewmen from bacterial concerns.

It cannot be stressed too highly that in the area of microbiological populations an overkill will pay more dividends than will an underkill. In this regard the contamination control groups recommendations should consistently be on the side of prudence as undoubtedly they are.

In order to establish a go-no go situation or criteria for cleanup of a surface a tolerable level of microbiological growth must be accepted. No better standards have been suggested than the levels indicated by the Intercenter Working Group for Skylab Microbial Contamination Control. Their effort has pinpointed various equipment and other hardware concerns. Analogous to these values and more relevant to personal hygiene impact have been the hospital oriented values that are used today. These criteria establish an acceptable, tolerable and unacceptable level for many surfaces and air flux (see Table I ). They are extrapolatory apropos space environments and are hereby suggested for personal hygiene decisions in lieu of any data to controvert these. These are not to be construed as absolute or mission critical. They are all livable values and only point up the degree of contamination. The table is established using spacecraft analogous areas to those used in the original guide. Using the sanitation agents proposed and the techniques suggested it may be feasible to reduce these values to an even more acceptable level.

It was recognized early in the analysis that no suggestion as to a cleaning agent would be acceptable unless compatibility with space materials was shown. This was done and the selected agents were found to be compatible with most materials including Vespell, Stainless Steel-Class I Polyimide, Teflon and Aluminum 6061-0. The use of these agents with suggested wipe materials such as the cellulose compressed sponge only results in a stained sponge that functions well for most cleanup purposes.

The reduction of microbes would alleviate one of the major areas of personal hygiene concern, namely unacceptable odors. This revelation was highlighted in the previous personal hygiene study wherein body odor rated as the prime concern (see Table II). Body odor is often produced and enhanced by sweating. In the recent SMEAT a great deal of exercise was performed by the subjects as a keep well measure and also as a function of compliance with certain medical oriented studies. The work produced metabolic heat which of course must be dissipated through the skin. Physiologically, the mechanism of this process involves an increased blood flow from the tissues involved and an internal blood flow to the cutaneous region. This is followed by sweat, evaporation, and the deposition on the skin of glandular secretions and inorganic salts. The relationship between the cutaneous blood volume and rate determines the pattern of heat dissipation from the body core to the skin. Concomitant with this rate of dissipation must be the impact of the clothing that surrounds the body and, too, the external environment.

TABLE 1 .

<u>Area</u> Description	Rodac Plate Sample Tolerance Range - Colonies		
	Acceptable	Tolerable	Unacceptable
<b>FOOD PREPARATION AREA</b>			
• Floors (Main Walking Area)	< 5	5-15	> 16
• Table/Countertops	< 5	5-10	> 11
<b>SLEEPING QUARTERS</b>			
• Floors	< 25	25-50	> 51
• Other Surface	< 10	10-15	> 15
<b>PERSONAL HYGIENE</b>			
• Floor	< 25	25-50	> 51
• Sink-Shower	< 15	15-25	> 26
• Toilet Seat	< 10	10-15	> 16
<b>ALL OTHER AREAS</b>			
• Floors	< 25	25-80	> 51
• Other Surfaces	< 5	5-8	> 9
<b>SWAB SAMPLES</b>	< 10/in. <sup>2</sup>	10-30/in. <sup>2</sup>	> 31/in. <sup>2</sup>
<b>AIR SAMPLES</b>	< 10/ft <sup>3</sup>	10-30/ft <sup>3</sup>	> 31/ft <sup>3</sup>

TABLE II. PERSONAL HYGIENE PROBLEMS

Rank	Problem	Percent	Number of Responses
1	Body odor	27.2	15
2	No shower water	12.7	7
2	Defecation process	12.7	7
3	Defecation odors	9.1	5
4	Odor from urine	5.4	3
5	Dirty feet	3.6	2
5	Vomitus	3.6	2
5	No oral hygiene facility	3.6	2
5	Excessive clamminess	3.6	2
6	Crowding	1.8	1
6	Grimy hands	1.8	1
6	No hair washing capability	1.8	1
6	No fresh clothing	1.8	1
6	Water had a chemical taste	1.8	1
6	Others unclean	1.8	1
6	Skin rash	1.8	1
6	Lack of real soap	1.8	1
6	Bad breath	1.8	1
6	Body dirt (general)	1.8	1

The loss of heat by evaporation of moisture via the body surface can range from 24% of the metabolic heat under resting conditions in a moderate climate to 100% under extreme heat loads. That this is a real measurable determination can be shown by scanning the body weight loss due to the amount of moisture exhaled or evaporated via the skin and from the clothing.

Evaporation of liquid at the surface is dependent on the difference in vapor pressure between the liquid; i.e., sweat, and that of the air in contact with it. Air movement at the interface will also influence the rate. The actual phase change is nurtured by the body's own heat as the liquid changes to vapor and then cools to air temperature.

The ability of the body to compensate for variations in the relative humidity (R. H.) of the surrounding air and maintain adequate heat loss by evaporation is a function of evaporative heat loss, wet skin, air velocity and direction, air temperature, and body activity. Clothed persons at rest in surroundings at air temperature will start sweating under the following conditions: 83°F (28.5°C) with R. H. 12%-35%, and at 75°F (23.9°C) with R. H. 75%-88%. Sweating will occur with work at lower temperatures. It is the wetted skin area that increases with rising air temperature and at higher R. H. The onset of this usually occurs at most any R. H. if the temperature of the skin reaches 95°F (35. C).

The sum of all of this liquid evaporation is the enhancement of skin habitats for surface bacterial growth. The increased temperature is also a positive factor in selective growth rates. The clothed individual will, by being in contact with his clothing, transfer sweat and skin debris of all forms to the fibers of the garment. Therefore, we have a second site for odor production and bacterial colonization.

The tractionless aspect of zero gravity may cause degradations in the output characteristics of work manually produced by the unbraced operator. These degradations can appear as either efficiency or total output capability decrements. In addition, they may be of sufficient magnitude to significantly impair the effectiveness of the human as a work and force producer in the tractionless state.

Previous simulated zero-gravity studies have shown that the achievement of adequate levels of sustained work can only be obtained by adequate bracing of the force producing

operator.<sup>6,7</sup> This means that the man attempting work in combination with his bracing technique, produce a force equal and opposite to the resisting force. In a tractionless environment, the development of these resultant forces may entail the utilization of many muscle groups other than those normally employed, with a subsequent loss of efficiency and an increase in the metabolic load. With the increase in the metabolic load comes added demands on the heat regulating mechanisms and a probable increase in sweat. The unrestrained exercise performed by one subject on SMEAT a 1-g study would be expected to add to the loading on the E. C. S., personal hygiene gear and metabolic costs both of a personal nature and food/water supplies. This increased effort can ultimately lead to a further requirement for body cleansing and further planning for cleanup techniques.

On the SMEAT program the following tabulation, Table III categorized the many incursions of either a dirt, sweat, odor, bacterial or other item of concern nature. The intent was to correlate the event with the product. This was not done but the table does indicate the many events and their potential.

In order to bring the proper perspective to any recommendations, familiarity with events and disorders related to personal hygiene should be reviewed.

Concern with waste management has been voiced from as far back in space time as the Mercury series. Various entrapment procedures and paste on type bags were utilized. The crew never felt clean after a fecal void. The few loose bowel movements reported as runny obviously left the person soiled. As recently as Apollo 17 incidents were still reported. The crew in turn requested procedures that would be earth analagous. The major fear here aside from the obvious discomfort and potentially health hazardous situation must be the decrement in work efficiency and judgment. Since the entire space program as envisaged, is geared to man's participation an obvious corollary must be the prevailing need to keep him functional.

Medical events such as stomach awareness which occurred on Apollo VIII along with other events and the colds experienced by all crewmen on Apollo VII, plus other documented episodes, require a procedure for containment of vomitus, urine spills, fecal material, nasal and throat discharges.

Crews have expressed opinions on matters such as lack of a cleansing agent, a wet wipe for cleansing one's person and a further wash up period following exercise. Emergency

**TABLE III. DATA INPUTS FROM SMEAT**

<u>Item of Concern</u>	<u>Derivation</u>	<u>Study Source Control No./or DTO Study No.</u>	<u>Format Input Basis</u>
Sweat-Salts	Exercise	71-1 M151	Medical Info. Video Tape
Bacteria	Mouth	71-2	Count Identify
Bacteria-Odor	Food Residue	71-7 and 71-8	Count Identify
Blood-Bacteria	Experimental	71-10 M110	Count
Bacteria	Instruments-Skin	71-18 1MSS	Count Identify
Sweat Bacteria	Instruments	71-20 OBS	Count Medical Info.
Bacteria	Indigenous	71-19	Count Identify
Bacteria-Odor	Body Wash	71-21	Count Identify/Chem.
Dirt-Bacteria	Habitation	71-25 M487	Count Identify
Dirt-Bacteria	Habitation	71-26 T003	Count Identify
Odor-Soil	Urine-Defecation	71-27	Observe- Chemistry
Bacteria	Aerosol-Dust	71-28	Count Identify
Sweat-Salts	Metabolic Activity	71-11 M171	Medical Info. Chemistry
Utility + Bacteria	Wipes-Sanitation Agent	71-30	Actual Count Subjective Commentary



procedures have not been precisely followed, re: spilled materials. Some of these events have been dealt with using the nearest material at hand. Up to the onset of the Skylab program space vehicles have been small in space causing a degree of overcrowding conducive to the possible exchange of respiratory or enteric organisms. Skylab offers more space, more surface area, and longer time intervals for events to occur.

Having presented a case for the presence of a dirty environment, it follows that recommendations should be forthcoming relative to keeping things and persons clean.

A recent study under a NASA contract by Fairchild NAS9-12205, re: Sanitation Agents offered the following information relative to both housekeeping and personal hygiene management. In order to perform the required function the agent must possess traits that render it stable, potent and effective for the time it is in contact with the particular surface, be it skin or table top. The stipulations as to safety and spacecraft compatibility have been satisfied. Based on these factors a pair of agents evolved that could find use in many tasks. The formulation for the systems maintenance agent was based on a 2-phase formulation.

Phase A	Cetyl alcohol Stearyl alcohol
Phase B	Chloramine T Duponol WAQ (sodium lauryl sulfate) Propylene glycol Distilled water

The personal hygiene agent formula was also 2-phased.

Phase A	Glycerol monostearate P. E. G. distearate Tween 60 Cetyl alcohol Isopropyl palmitate Cetol
Phase B	Nonisol 250 (Ciba-Geigy) Propylene glycol Distilled water

The need was expressed on SMEAT for a cleansing agent to be employed for surface washup. The sanitation agent previously mentioned can serve that purpose handily. It possesses dirt removing properties and can sterilize surfaces to a limited extent. Its use is suggested wherever a surface can be reached by hand since the application would be by a sponge cloth wet with the agent. This will provide a bacteriostatic residue of a non-gooey nature. This of course is the prescription for normal routine cleansing. Cleansing of an emergency nature, e.g., food spill, vomitus, urine spill or loose bowel discharge must be planned for on an emergency cum routine basis.

The establishment of procedures is the most critical facet of the whole concept. The measures employed on SMEAT and on some Apollo flights wherein anything at hand was employed to clean up a spill or remove some form of undesirable debris is hardly in keeping with good scientific planning and can in fact pose more problems than it solves. On SMEAT it was reported that used washcloths and towels were deliberately saved to be used in housekeeping tasks. The thought being to find a second use for a used article. While the idea is a sound one, the results indicating an increase or retention of bacterial populations hardly justifies this economy. The use of an undershirt to mop up urine that spilled resulted in the presence of a film of urine, a site of odor producing organisms, a soiled undergarment, the distinct possibility that the user soiled his hands and perhaps set into being aerosol particles that could impact almost anywhere. The microbiology report elicited by SMEAT implied or anticipated some few of these possibilities. Stomach awareness with its potential for a truly distressing eventuality requires better planning than someone's dirty towel.

A review of past flights has pointed out various shortcomings that can be corrected with, it is felt, minimum impact on any critical area. There is a need for wet wipes to be used for a host of cleanup tasks and also to aid in anal cleansing. The presence of gloves, compressed cellulose sponges (expansion ratio 30:1) for liquid retrieval and antiseptic impregnated wet wipes would do much to dissolve the concern for emergencies such as those which have occurred and are predictable. The precise procedure for each event would vary with the degree of solid/liquid ratio present and the inherent nature of the material i.e., feces versus fruit (spilled). Naturally, one assumes liquid might flood a critical component or area. However,

the aerosolization of some solids might be equally as critical. Consequently, while the substance might vary, the approach would probably be similar. The sequence would be to first isolate and contain the unwanted material. It could be absorbed by compressed sponge or enveloped by wet wipe. Following this would be the donning of gloves, physically removing the substance and topical wipe up with an antiseptic wet wipe.

## SECTION Va. SHOWER WATER CHEMISTRY

A review of shower water chemistry with reference to the reclaimability of that water for continued human usage was suggested by the contract monitor. With this in mind a basic understanding of various techniques to accomplish this was undertaken. The summary follows:

1. The technique known as change of phase involves the actual distillation of the water from its residue. It is truly a combination of evaporation and distillation with evaporation being the main force. Pure distillation can be attempted at a 1 atmosphere pressure but more realistically must be considered at the prevailing space cabin atmospheric pressure. With this assumption and considering a 1/3 atmosphere pressure as very probable, the product obtained would not be too acceptable from all accounts.
2. If the liquid-vapor approach is to consider distillation under vacuum, one may presume a ready source of vacuum, namely space. However, this assumption which argues that the use of the pressure of space is devoid of penalty is somewhat unrealistic and should be given serious thought prior to even considering it on a long term space flight. This is based on the logic involved in not venting to space any modicum of  $H_2O$  or  $CO_2$  that could produce  $O_2$  on a truly long sojourn. The concept of distilling under vacuum has been shown to be a good approach because it, in conjunction with lesser temperatures avoids the carryover, and aids in suppression, of decomposition products. However, as of this review pressures as low as 0.2 - 0.4 mm Hg have not produced a distillate completely acceptable.
3. Air evaporation is still another approach. While theoretically sound in that it is basically a passive distillation relying as it does on a natural temperature differential, it does have its drawbacks. These would have to include the need for ion exchange resins, sponges, active carbon and orientation of the radiation panel away from the earth and sun.
4. The use of solid-vapor processes such as freeze drying imposes rigid control levels on all phases of this approach. In this lyophilization scheme the water is frozen then sublimed. This involves critical heat periods and freezing periods. The state of the art has proceeded to a clearly acceptable level and does produce a good product. The hardware for space use may prove to be the stumbling block.

5. Liquid to solid concepts include freeze crystallization, column crystallization, countercurrent crystallization and zone refining. The need to constantly re-refine the ice crystals formed and the frequency of this event seems to neutralize the simplicity of the concept. Space use would almost require finite manipulations with each component present in the liquid.

The major area of examination for space potential must be the various membrane processes. It is here that the liquid phase as an entity is treated for its liquid characteristics. Most of these processes are based on a repeated dilution of the undesirable elements and the eventual purification of the water. Some programs are passive and some few require electrical energy. The former category offers the simplicity of natural laws of diffusion and osmosis. The one utilizes the movement of solids, ions, proteins or other materials in response to a simple ratio of concentration readily discernible in the case of diffusion. As regards osmosis, the introduction of the selectively permeable membrane selects out as it were the nonpenetrating solid components irrespective of concentration gradients. Therefore, the water in steps could be refined. However, the residue can be substantial and requires removal and discard. The only salvable aspect of the process would involve the possibility of reclamation of some residue.

- 1) The term reverse osmosis has become popular to describe the ultra-filtration of water in a direction opposite to that expected in a normal osmotic gradient, namely water flowing to a region of higher concentration of salts, protein, etc. In ultrafiltration pressure is applied to the original concentrated salt solution so that it exceeds the prevailing osmotic pressure. Therefore, the flow of water is reversed, i.e., out of the salt concentration. Pressure of close to 50 atmospheres may be required.
- 2) Ion exchange membranes are essentially related to resin beds. As such they would require additional chemicals to elute the trapped materials.
- 3) Membrane permeation is a process that calls on a layered array of membranes to utilize a temperature gradient for water movement.

In the region of energy input of a direct nature usually direct current, the following are the most promising:

1. Electro-osmosis is the movement of water in response to electrical current. This would also involve ion movement with little separation of dissolved ions.
2. Electrodialysis selects the various ions by virtue of differential electrical charges based on specifically designed plastic membranes. The cell so engaged contains alternate cation-anion permeable membranes. Upon the application of an EMF, positive ions such as potassium and sodium pass through the cation-permeable membranes, and in turn the negative ions such as chloride enter the anion-permeable membranes. Therefore, the water passing through each in turn is stripped of ionizable materials.

In addition to these discreet processes there are many combination patterns employing physical and chemical treatment. These would include gas hydrate formation (e.g., hydrocarbons that form addition-compounds with water) solvent extraction; vacuum distillation using vapor compression, spray condensers, pyrolysis of vapor. This last employs in addition to vacuum distillation a catalytic oxidation treatment of the evaporated water in the vapor phase. A potable water emerges.

The thermoelectric approach was voted a favorite with Fairchild scientists a few years back in conjunction with space refrigerators and freezers. The concept is simple and efficient while providing a minimum penalty in weight, size and power.

Electrolytic schemes make use of the waste materials and as such can provide good water.

- 1) Electrolysis with combustion would provide the release of hydrogen employing the electrolysis phase with combustion recombining these into water. The high temperature utilized would destroy most organic material and even add their by-products to the recovery of water.
- 2) Electrolysis followed by fuel cell use of hydrogen and oxygen appears to offer a something for nothing approach in that power is produced with water as the waste product.

This cursory review of most of the major approaches to water reclamation singles out the pitfalls present in trying to reclaim shower water. In the beginning it was necessary to analyse the shower water residue. This was done on eight occasions and represents pooled water. The results of the analyses are indicated in Tables IV and V.

What these values mean in immediate acceptability of the water is apparent and no attempt is being made to recommend usage. These values when compared to acceptability levels of the USPHS, WHO, and NAS/NASA simply show how far we have to go (see Table VI).

In the areas where there are values for comparison, the means of the eight shower water batches show the following:

Odor	-	Acceptable
Sulfate	-	Below maxima
Chloride	-	Below maxima
Total Solids	-	Above maxima
Magnesium	-	Below maxima
Calcium	-	Below maxima
Potassium	-	Below maxima
Sodium	-	Below maxima

It was of interest to note that this analysis showed no trace of cholesterol, uric acid or creatinine.

It has been estimated that normal skin contributions will provide among other components the following substances at the levels indicated. This of course must be for normal activity and will increase in some areas with the degree of sweat produced. In order to establish a basis for some degree of comparison with the prior shower water values these values are presented for one individual only. That is a typical male adult.

Sodium	800 mg/day
Potassium	300 mg/day
Chloride	800 mg/day
Magnesium	1 mg/day
Calcium	10 mg/day

The significance in these numbers might be in the accumulative values that could be present between each shower. Even allowing for physical loss or metabolic (bacterial)

TABLE IV. SHOWER WATER CHEMISTRY

Lab Number								Specific Conductivity Micromhos/Cm	Parts Per Million																																						
									Dissolved Protein Mg %	O d o r	Jackson Kendall Units of Turbidity	pH			Nitrogen % N <sub>2</sub>				Total Organic Carbon				Pt. Co. Apparent Color				Pt. Co. True Color				Sulfate			Calcium			Magnesium										
1	2	3	4	5	6	7	8	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	
4489	2	0	0	0	0	0	0	2	0	•	0	5	4	2	0	7	•	4	0	•	1	0	1	6	8	7	1	3	6	0	1	0	5	0	1	2	5	1	0	•	0		3	•	8		
4491	1	1	6	0	0	0	0	1	8	•	0	5	5	5	0	7	•	2	0	•	0	6	1	6	8	9	2	0	0	0	1	0	5	0	2	6	0		7	•	5		7	•	0		
4820	1	7	0	0	0	0	0		8	•	5	7	3	4	0	7	•	7	0	•	0	0	1	5	3	0	1	5	0	0	1	0	0	0	0	0	0		8	•	6		8	•	8		
4821	1	5	0	0	0	0	0		5	•	5	3	2	9	0	7	•	5	0	•	0	7	1	0	8	0	0	6	0	0	0	5	0	0	0	0	0	1	0	•	0	1	0	•	0		
4822	1	8	0	0	0	0	0		2	•	5	3	1	8	5	7	•	8	0	•	0	9	1	0	8	0	0	7	0	0	0	2	4	0	0	0	0		6	•	4	6	8	•	0		
4823	1	8	0	0	0	0	0		3	•	0	3	2	7	5	8	•	0	0	•	0	6	1	0	8	0	0	6	0	0	0	4	4	0	0	0	0		6	•	4	6	8	•	0		
4824	2	5	0	0	0	0	0		1	•	5	3	3	7	5	7	•	9	0	•	0	5	1	1	7	5	1	8	0	0	0	9	0	0	0	0	0		5	•	4	4	4	•	0		
4825	1	5	0	0	0	0	0		2	2	•	5	6	9	9	9	8	•	4	0	•	0	9	2	0	7	0	4	2	0	0	2	4	0	0	0	0	0		4	•	6	5	7	•	6	
										•																													•			•					
MEAN	1	8	0	0	0	0	0		1	0	•	1		4	4	1	7	•	7	0	•	0	7	1	4	3	0	1	5	9	5	0	9	4	7	1	9	2		7	•	3	3	3	•	4	
1	2	3	4	5	6	7	8	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	

• = Decimal



TABLE V. SHOWER WATER CHEMISTRY

								PPM		PARTS PER MILLION																																									
Lab Number								K	Det.	Sodium				Chloride				TP			TDS				TSS				TS				TVS				Uric Acid Mg %					Creatinine Mg %					Cholesterol Mg %				
1	2	3	4	5	6	7	8			13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51			
4	4	8	9	1	4	6	0			3	0	0	5	3	5	2	0	0	2	4	2	0	6	6	4	3	0	9	0	2	1	8	1			0	0	0			0	0	0			0	0	0			
4	4	9	1	1	4	4	0			3	2	0	5	7	7	4	0	0	2	2	1	0	6	1	0	3	0	6	8	2	1	0	8			0	0	0			0	0	0			0	0	0			
4	8	2	0	7	5	9	9			2	5	0	3	0	0	3	0	6	2	1	0	0	4	2	0	2	5	5	2	1	6	7	1			0	0	0			0	0	0			0	0	0			
4	8	2	1	9	0	0	0			2	1	0	2	7	5	3	0	0	2	1	0	0	2	6	0	2	3	2	7	1	8	2	9			0	0	0			0	0	0			0	0	0			
4	8	2	2	8	0	0	0			2	0	0	2	5	0	4	0	2	2	4	4	0	2	6	0	2	9	5	9	2	2	3	2			0	0	0			0	0	0			0	0	0			
4	8	2	3	7	5	0	0			1	8	0	2	5	0	2	0	6	2	1	3	0	2	4	0	2	7	7	0	1	7	5	1			0	0	0			0	0	0			0	0	0			
4	8	2	4	7	5	0	0			2	4	0	3	1	0	2	0	2	1	8	4	0	2	8	0	2	3	5	1	1	4	8	2			0	0	0			0	0	0			0	0	0			
4	8	2	5	6	0	9	9			1	5	0	2	0	0	3	0	0	2	2	5	0	9	9	9	3	5	1	4	2	7	8	8			0	0	0			0	0	0			0	0	0			
M	E	A	N							2	3	1	3	3	7	3	0	0	2	1	8	6	4	8	0	2	8	2	8	1	9	6	7			0	0	0			0	0	0			0	0	0			
1	2	3	4	5	6	7	8			13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51			

### LEGEND

- - Decimal
- Det. - Detergent
- T-P - Total Phosphorous
- TPS - Total Dissolved Solids
- TSS - Total Suspended Solids
- T. S. - Total Solids
- TVS - Total Vaporized Solids

**TABLE VI. POTABLE RECLAIMED WASTE WATER -  
COMPARISON CHART OF MAXIMA**

<u>Chemical, mg./liter</u>	<u>USPHS</u>	<u>WHO</u>	<u>NAS/NASA</u>
Alkyl benzene sulfonate	0.5	-	-
Ammonia (NH <sub>3</sub> )	-	0.5 <sup>+</sup>	-
Arsenic	0.05□	0.2 <sup>+</sup> ±	0.5
Barium	1.0 □	-	2.0
Boron	-	-	5.0
Cadmium	0.01□	0.05 <sup>+</sup>	0.05
Calcium	-	200 ±	-
Carbon CHCl <sub>3</sub> Extract	0.2	-	-
Total Oxygen Demand	-	-	100
Chloride	250	350 <sup>+</sup>	450
Chromium (CrO <sub>4</sub> <sup>=</sup> )	0.05□	0.05 <sup>+</sup> ±	0.05
Copper	1.0	3.0 <sup>+</sup>	3.0
Cyanide	0.2	0.01 <sup>+</sup> ±	-
Fluoride	1.6-3.4□	1.5 <sup>+</sup>	2.0
Iron	0.3	1.0 ±	-
Lead	0.05□	0.1 <sup>+</sup> ±	0.2
Magnesium	-	125 <sup>+</sup>	-
Manganese	0.05	0.1 <sup>+</sup>	-
Nitrate, as NO <sub>3</sub>	45	50 <sup>+</sup>	10 •
Phenolics	0.001	0.001 <sup>+</sup>	-
Selenium	0.01 □	0.05 <sup>+</sup> ±	0.05
Silver	0.05 □	-	0.5
Sulfate	250	250 <sup>+</sup>	250
Total Solids	500	1500 ±	1000
Zinc	5.0	5.0 <sup>+</sup>	-
<u>Physical</u>			
Turbidity (Jackson)	5	-	≤ 10
Color (Pt-Co)	15	-	≤ 15
Taste	-	-	Non objectionable
Odor, Max. Threshold	3	-	Non objectionable
Foaming	-	-	≤ 15 sec Non persistent

- <sup>+</sup> WHO European Standards of 1961
- ± WHO International Standards of 1958
- Mandatory. Others recommended by USPHS
- Nitrate and Nitrite (as Nitrogen)

activity, re: anabolism or catabolism a significant contribution remains. Couple this with the dilution effect of the shower water and soap constituents and perhaps the values are manageable.

The soaps used on SMEAT and possibly to be used on the Skylab series are Neutrogena and Miranol JEM Their basic chemistry follows:

Neutrogena

Triethanol amine  
Castor oil  
Beef tallow  
Na OH  
Deionized water  
Emersol Salt #233 (oleic acid)  
Emersol Salt #6332 (Stearic acid)  
Emory 6515 Coconut  
Super diethylamine  
Glycerine

Miranol JEM

Dicarboxylic acid  
Coconut derivative  
Diethylamine salt  
(all anionic)

As regards any reclamation of water procedure, including those listed previously, a great deal of consideration must be granted the chemistry of the body skin products and/or the soaps employed.

## SECTION VI

### ANALYSIS AND RECOMMENDATIONS

An analysis of metabolic data indicates that subject number two had the major physiological alterations in body weight. He lost 4.4 kilograms. His work record indicates extensive exercise periods, increased water intake following exercise periods, and as the study wound up a decided increase in urination frequencies. The frequent exercise undoubtedly posed many personal hygiene problems ranging from sweat, to body odor, to soiled garments or equipment and a stepped up depletion rate of various supplied items.

In the course of the SMEAT study frequent spills of urine occurred. One can only guess at whether or not the increased bacterial load that was present in the chamber owed any aspect of its survival to improper housekeeping. The presence of fungus in the sink area would also indicate a potential concern apropos microorganisms.

The use of a sanitizing agent on a routine time line fixed non-discretionary basis is recommended for surface cleanup. Accidents of a personal hygiene nature should be controlled by adequate and proper techniques utilizing specific items earmarked for the task. More concern should be given to the use of gloves, compressed sponges, pre-packaged wet wipes containing a sanitation agent and waste disposal.

It is recommended that direction should be given to preclude transfer of nasal, oral or other discharges to other crewmen via tissues, aerosols or direct transfer. On SMEAT the sink employed, drained poorly. Any expectoration e.g., during teeth cleansing, would coat the surface. The closure on the SMEAT tissue waste disposal bag was such that a soiled tissue could be expected to liberally coat the surface upon insertion. Recognizing fully that these items were probably SMEAT peculiar it is nevertheless felt that the logic should be extrapolated to Skylab and beyond.

The usage rates as indicated in the appendix describe those items deemed useful. The quantities used further reflect the required resupply of those items.

Crews should be permitted to select their own personal hygiene items from standardized kits.

**SECTION VII**  
**SUGGESTED ADDITIONAL EFFORT**

**Follow-on work should be timely as to onset and be directed at preventative measures, personal hygiene paraphernalia of all sorts, training procedures both routine and emergency, equipment use rates and the constant updating of all aspects of house-keeping, personal hygiene and waste management that influence or interact with a clean living environment in long term space flights.**

**Rapid corrective measures should be studied for any situation requiring such action. A study of systems that might contribute "dirt", or physical and/or physiological events should be conducted in conjunction with training and mock-up activities.**

**SMEAT STOWAGE LIST - USAGE RATE**

<u>Item Supplied</u>	<u>Precount</u>	<u>Used</u>	<u>Unused</u>	<u>Comments</u>
pH. Kits	( 3 )			
Deodorant Stick	3	0	3	B. O. apparently no problem
Skin Emollient	6	2	4	Thornton had none left
Cotton Swabs	45	17	28	
Dental Floss	3	3	0	
Styptic Pencil	3	0	3	
Nail Clippers	3	3	0	
Toenail Clippers	3	3	0	
Razor Blades	30	14	16	
Windup Razor	3	3	0	
Shaving Cream	3	1	2	Thornton Shaved
Wet Razor	3	3	0	
Hair Brush	3	3	0	
Hair Comb	3	3	0	
Hair Shapoo	3	1	2	
Hair Trimmer	3	3	0	
PH Resupply Kit	( 1 )			
Toothbrushes	6	3	3	
Toothpaste	6	6	0	
Windup Razor	1	1	0	
Windup Razor Head	2	0	2	
Skin Emollient	6	0	6	
Mirror	1	0	1	
Towels	168	138	30	
Washcloths	336	139	197	
Pillow Cases	12	9	3	
Pillows	3	1	2	
Top Sheets	12	5	7	
Bottom Sheets	12	6	6	
Blankets	6	1	5	
CWG	6	2	4	
G. P. Tissues	1960			
Wipes Utility	1568	1629		

**FUNCTIONAL PERSONAL HYGIENE EVALUATION**

ITEM	Quantity			Functionability			Acceptability		
	1	2	3	1	2	3	1	2	3
Skin Emollient									
Cotton Swabs									
Dental Floss									
Styptic Pencil									
Nail Clippers									
Toe Nail Clippers									
Razor Blades									
Wind-up Razor									
Shaving Cream									
Razor									
Hair Brush									
Hair Comb									
Hair Shampoo									
Hair Trimmer									
Soap									
Miromal JEM									
Utility Wipes									
All Purpose Wipes									
Toothpaste									
Toothbrush									
Towel									
SMEAT washcloth									
"OWS" Washcloth									
Sheets									
Underwear-Shirt									
Socks									
Trousers									
Underwear-Shorts									

SMEAT METABOLIC DATA  
PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS			
2	3	4	

SUBJECT		TIME OF DAY							WORK IN WATTS							BODY WEIGHT KILOGRAMS							* FLUID INTAKE							URINE VOIDS DAILY		OTHER WORK ACTIVITIES							COMMENT						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32												
X					0	1	3	0		2	5	2	6	7	1	2	0	1	9	2	7	0	6																						
	X								1	0	0	0	0	9	2	1	5	0	6	6	2	0	7																						
		X												8	3	9	0	0	7	0	6	0	7																						
X									1	6	2	3	7	1	2	0	1	9	3	0	0	7																							
	X								2	6	7	2	9	2	5	0	0	7	3	6	0	7																							
		X							1	7	6	2	8	3	9	0	0	7	1	7	0	8																							
X									2	5	9	8	7	1	6	0	1	9	3	0	0	5																							
	X								8	2	9	5	9	2	3	0	0	7	7	3	0	6																							
		X							3	3	4	3	8	3	9	0	0	7	1	7	0	6																							

DAY

2

3

4

\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER



## SMEAT METABOLIC DATA

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS		
5	6	7

DAY	SUBJECT		TIME OF DAY					WORK IN WATTS					BODY WEIGHT KILOGRAMS					* FLUID INTAKE					URINE VOIDS DAILY		OTHER WORK ACTIVITIES					COMMENT				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
5	X			0	1	3	1						7	1	5	0	1	9	3	4	0	5												
		X											9	2	0	7	0	8	1	2	0	8												
			X										8	4	4	0	0	7	2	5	0	7												
6	X			0	1	3	8	1	4	7	4		7	1	4	0	1	9	3	7	0	8												
		X						2	7	3	4		9	2	0	7	0	8	4	4	0	9												
			X					1	7	8	1		8	3	9	0	0	7	3	8	0	9												
7	X			0	1	3	1						7	1	4	0	1	9	3	7	0	5		M	1	7	1							
		X											9	2	0	7	0	8	4	4	0	5		M	1	7	1							
			X										8	4	0	0	0	7	3	8	0	7		M	1	7	1							

**\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER**

Fairchild Republic Division Farmingdale, New York 11735

## PERSONAL HYGIENE CONCERNS

8	9	10
EXPERIMENT DAYS		

[illegible]

**\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER**

# SMEAT METABOLIC DATA

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS			
11	12	13	

DAY	SUBJECT		TIME OF DAY								WORK IN WATTS								BODY WEIGHT KILOGRAMS						* FLUID INTAKE						URINE VOIDS DAILY		OTHER WORK ACTIVITIES								COMMENT							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32																
11	X			0	1	2	5		4	5	5	3	7	1	2	0	1	9	5	2	0	7																										
		X						1	1	6	0	0	9	2	0	7	1	0	4	5	0	7																										
			X										8	4	2	0	0	7	7	3	0	7																										
12	X			0	1	2	5		1	5	1	8	7	1	1	0	1	9	5	5	0	8																										
		X							2	7	0	3	9	1	5	0	1	1	0	8	0	7																										
			X						1	8	1	1	8	3	8	0	0	7	8	2	0	9																										
13	X			0	1	3	0						7	0	9	8	1	9	5	5	0	6																										
		X						1	8	3	0	0	9	1	8	5	1	6	3	1	0	6																										
			X						5	0	0	0	8	4	0	1	0	7	9	0	0	8																										

\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER

# FAIRCHILD

## SMEAT METABOLIC DATA

# PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS		
14	15	16

[illegible]

**\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER**

# FAIRCHILD

## SMEAT METABOLIC DATA

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS		
17	18	19

[illegible]

**\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER**

# SMEAT METABOLIC DATA

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS		
20	21	22

DAY	SUBJECT	TIME OF DAY								WORK IN WATTS				BODY WEIGHT KILOGRAMS				FLUID INTAKE				URINE VOIDS DAILY	OTHER WORK ACTIVITIES							COMMENT			
20	X	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
					0	1	4	0		5	3	1	3	7	1	4	0	1	9	7	5	0	6										
	X								1	9	1	7	5	9	1	1	7	1	5	5	9	0	6										
				X						1	5	0	0	8	4	6	0		8	2	3	0	8										
21	X				0	1	4	0						7	1	6	0	1	9	7	6	0	7										
		X								5	0	0	0	9	1	0	5	1	6	7	5	0	5										
				X										8	4	4	2		8	3	5	0	7										
22	X				0	1	4	0		5	3	6	2	7	1	8	8	1	9	7	8	0	8										
		X							1	9	7	5	0	9	0	9	2	1	7	3	2	0	7										
			X								6	0	0	8	4	4	6		8	4	8	0	6										

\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER

**Fairchild Republic Division Farmingdale, New York 11735**

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS		
23	24	25

[illegible]

**\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER**

**Falchöld Republic Division Farmingdale, New York 11735**

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS		
26	27	28

[illegible]

**\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER.**



# SMEAT METABOLIC DATA

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS		
29	30	31

SUBJECT		TIME OF DAY							WORK IN WATTS							BODY WEIGHT KILOGRAMS							* FLUID INTAKE							URINE VOIDS DAILY		OTHER WORK ACTIVITIES							COMMENT						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32												
DAY 29		X			0	1	3	7		5	3	2	9	7	1	6	5	1	9	9	4	0	6																						
	X							1	4	0	0	0	0	8	9	9	0	2	3	6	9	0	5																						
		X							6	5	0	0	0	8	4	3	5		9	3	4	0	7																						
30		X			0	1	3	3						7	1	5	4	1	9	9	5	0	5	M	17	1																			
	X													8	9	6	7	2	4	7	5	1	0																						
		X												8	4	3	5		9	6	0	1	0	M	17	1																			
31		X			0	1	3	0		5	3	3	1	7	1	2	0	1	9	9	8	0	5																						
	X							1	7	6	9	1	8	9	7	9	2	6	2	8	0	6																							
		X												8	4	6	9	9	8	2	0	7																							

\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER

# SWEAT METABOLIC DATA

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS		
32	33	34

DAY	SUBJECT		TIME OF DAY							WORK IN WATTS							BODY WEIGHT KILOGRAMS							* FLUID INTAKE							URINE VOIDS DAILY	OTHER WORK ACTIVITIES							COMMENT						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32													
32	x			0	1	3	2		5	4	0	1	7	1	0	8	2	0	1	2	0	6																							
		x						1	6	0	0	0	8	9	6	7	2	7	5	0	0	6																							
33			x						5	0	0	0	8	4	5	7		9	9	0	0	6	M	1	7																				
	x			0	1	3	4						7	1	3	1	2	0	1	5	0	5	M	0	9	3	(2x)																		
34		x						1	5	7	0	0	8	9	7	9	2	8	5	3	0	7	M	0	9	3																			
			x						5	0	0	0	8	4	4	6		9	9	3	0	6	M	0	9	3																			
	x			0	1	3	7		4	8	1	2	7	1	8	7	2	0	3	7	0	4																							
		x							6	6	5	5	8	9	7	9	2	9	5	8	0	9																							
			x						5	5	0	0	8	4	6	9	1	0	2	0	7																								

\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER

# FAIRCHILD

## SMEAT METABOLIC DATA

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS		
35	36	37

[illegible]

**\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER**

# SWEAT METABOLIC DATA

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS		
38	39	40

DAY	SUBJECT			TIME OF DAY				WORK IN WATTS				BODY WEIGHT KILOGRAMS				* FLUID INTAKE				URINE VOIDS DAILY	OTHER WORK ACTIVITIES				COMMENT								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
38	x			0	1	3	1		5	2	6	5	7	0	8	5	2	0	4	3	0	4											
		x						1	4	3	0	6	8	9	5	6	3	2	3	5	0	7											
			x						5	5	0	0	8	4	5	7	1	0	5	2	0	7											
	x			0	1	3	0						7	0	9	7	2	0	4	3	0	5	M093										
39		x											8	9	2	3	3	2	9	6	0	9	M093										
			x										8	4	4	6	1	0	5	8	0	8	M093										
	x			0	1	3	2		5	9	3	0	7	1	5	4	2	0	4	5	0	5											
								1	2	9	3	3	8	8	7	7	3	3	8	9	1	0											
40			x										8	4	2	3	1	0	6	4	0	8											

\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER

# SWEAT METABOLIC DATA

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS			
41	42	43	

DAY	SUBJECT			TIME OF DAY							WORK IN WATTS							BODY WEIGHT KILOGRAMS					* FLUID INTAKE					URINE VOIDS DAILY	OTHER WORK ACTIVITIES							COMMENT						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32										
41	x			0	1	3	0		6	0	4	0	7	1	0	8	2	0	4	7	0	6																				
		x							9	6	6	0	8	8	8	8	3	4	0	5	0	9																				
42	x		x						6	0	4	0	8	4	3	5	1	0	6	7	0	8																				
				0	1	3	0						7	1	2	0	2	0	4	7	0	6	M	17																		
43		x							8	5	0	0	8	8	8	8	3	8	8	8	0	8																				
			x										8	4	3	5	1	0	7	8	0	8	M	17																		
	x			0	1	4	0						7	0	7	4	2	0	4	7	0	6	M	17																		
		x						1	1	5	0	0	8	8	8	8	3	5	4	2	0	8																				
			x										8	4	2	3	1	0	8	3	0	6	M	17																		

\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER

**Fairchild Republic Division Farmingdale, New York 11735**

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS	44	45	46
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[illegible]

**\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER**

# SMEAT METABOLIC DATA

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS			
47	48	49	

SUBJECT		TIME OF DAY							WORK IN WATTS							BODY WEIGHT KILOGRAMS							FLUID INTAKE							* URINE VOIDS DAILY	OTHER WORK ACTIVITIES							COMMENT						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		29	30	31	32										
DAY 47		x			0	1	3	4					7	1	1	9	2	0	5	5	0	5																						
			x										8	8	4	3	3	7	6	7	0	9																						
				x									8	4	3	5	1	0	9	8	0	7																						
48		x			0	1	3	3					7	1	0	8	2	0	5	5	0	7	M	1	7																			
			x						6	7	5	0		8	8	4	3	3	8	2	1	0																						
				x					5	0	0	0		8	4	5	7	1	1	0	2	0	6	M	1	7																		
49		x			0	1	3	6		6	0	0	0	7	0	9	7	2	0	5	0	7																						
			x						8	5	0	0		8	8	3	2	3	8	9	7	0	9																					
				x					6	0	0	0		8	4	6	9	1	1	1	0	0	7																					

\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER

# FAIRCHILD

Fairchild Republic Division Farmingdale, New York 11735

## SMEAT METABOLIC DATA

### PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS		
50	51	52

DAY	SUBJECT			TIME OF DAY				WORK IN WATTS				BODY WEIGHT KILOGRAMS				FLUID INTAKE				* URINE VOIDS DAILY	OTHER WORK ACTIVITIES							COMMENT						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		20	21	22	23	24	25	26	27	28	29	30	31	32	
50	x			0	1	3	6		6	0	0	0	7	0	6	3	2	0	5	5	0	6	M171											
		x						2	3	2	8	0	8	8	6	5	3	9	4	3	0	8	M171											
51	x		x	0	1	3	1						7	0	6	3	2	0	5	5	0	7	M093											
		x											8	8	4	3	4	0	0	5	1	0	M171											
52	x		x	0	1	3	3						8	4	4	6	1	1	1	7	0	6	M093											
		x							9	2	4	6	8	8	4	3	4	0	7	9	0	9	M171											
			x						6	5	0	0	8	4	3	5	1	1	1	7	0	6												

\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER



**Fairchild Republic Division Farmingdale, New York 11735**

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS		
53	54	55

DAY	SUBJECT			TIME OF DAY				WORK IN WATTS					BODY WEIGHT KILOGRAMS					* FLUID INTAKE					URINE VOIDS DAILY		OTHER WORK ACTIVITIES							COMMENT						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32						
53	x			0	1	3	2		6	0	0	0	7	0	.	7	4	2	0	6	6	0	6															
		x						1	5	0	0	0	8	7	.	6	3	4	1	2	1	0	8															
			x										8	4	.	0	1	1	1	2	1	0	8															
	x			0	1	3	0						7	0	.	7	4	2	0	6	6	0	6	M171														
54		x											8	7	.	6	3	4	1	9	3	0	9															
			x										8	7	.	6	3	4	1	1	2	4	0	7	M171													
	x			0	1	3	0						7	0	.	7	4	2	0	6	6	0	6															
55			x						5	4	0	0	8	4	.	0	1	1	1	2	4	0	7	M171														
	x			0	1	3	2		6	0	0	0	7	0	.	6	3	2	0	6	6	0	6	M171														
		x						1	5	0	0	0	8	8	.	3	2	4	2	7	2	0	7	M171														
			x						5	0	0	0	8	4	.	1	2	1	1	3	0	0	6	M171														

**\*\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER**

Fairchild Republic Division Farmingdale, New York 11735

## PERSONAL HYGIENE CONCERNS

EXPERIMENT DAYS	56
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[illegible]

**\* WATER GUN READING. AN INCREASE OF TWO DIGITS IS EQUIVALENT TO ONE OUNCE OF WATER**

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**PERSONAL HYGIENE QUESTIONNAIRE**

**FOR SMEAT**

**NASA CONTRACT NAS 9-12866**

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**

**MANNED SPACECRAFT CENTER**

**HOUSTON, TEXAS**

**INSTRUCTIONS:**

On the following pages is a list of items that may be used to describe some of your attitudes toward various aspects of hygiene. Each item describes a specific kind of attitude or behavior pattern. Although some items appear or may appear to be similar, they express or examine differences that are important in the maintenance of personal hygiene. Each question should be considered as a separate entity. This is not a test of ability or consistency in making answers. Its only purpose is to make it possible for you to describe, as accurately as you can, your behavioral patterns/attitudes toward the specific items presented. Please answer these items as honestly as you can.

In responding to the following items, follow the instructions presented below:

1. Read each item carefully.
2. Think about how you feel or would feel about the item.
3. Decide whether you:
  - A. Disagree with the item strongly.
  - B. Disagree with the item moderately.
  - C. Are indifferent or undecided about the item.
  - D. Agree with the item moderately.
  - E. Agree with the item strongly.

Draw a circle around one of the five letters ( A B C D E ) following the item to show the answer you have selected. Remember:

- |   |   |                          |
|---|---|--------------------------|
| A | = | Disagree with strongly   |
| B | = | Disagree with moderately |
| C | = | Undecided or indifferent |
| D | = | Agree with moderately    |
| E | = | Agree with strongly      |

- |  |           |
|--|-----------|
| 1. The odor from "dirty" hair is offensive to me.                    | A B C D E |
| 2. I enjoy variety in my clothing styles.                            | A B C D E |
| 3. I feel I must shower at least twice a week.                       | A B C D E |
| 4. Mouth odor is one of the most unpleasant aspects of many persons. | A B C D E |
| 5. The old saying: "Cleanliness is next to Godliness" is true.       | A B C D E |
| 6. Washing my hair relaxes me.                                       | A B C D E |

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- |  |           |
|--|-----------|
| 7. If I do not shower often, I feel dirty.   | A B C D E |
| 8. Dirty nails "bother" me.  | A B C D E |
| 9. Dental hygiene is important to me.  | A B C D E |
| 10. Stubble or beards are uncomfortable to me.   | A B C D E |
| 11. I am not aware of "dirty" hair until I have dandruff.  | A B C D E |
| 12. Wearing unironed clothing is uncomfortable.  | A B C D E |
| 13. Washing with a "chemical wipe" would satisfy me as much as a "wet" shower.                                   | A B C D E |
| 14. Mouthwash is as effective as brushing in keeping the mouth clean.  | A B C D E |
| 15. A feel better when I present a good physical appearance.   | A B C D E |
| 16. I feel I should wash my hair approximately every other day.  | A B C D E |
| 17. A "chemical wipe" is as effective a cleaning method as a "wet" shower.                                       | A B C D E |
| 18. I can tell how a person feels about himself by how he cares for the appearance of his fingernails and hands. | A B C D E |
| 19. I often feel there is a "film" in my mouth.  | A B C D E |
| 20. I feel I must shave at least once a day.   | A B C D E |
| 21. A dry hair wash (chemical) is as desirable as a "wet" one.   | A B C D E |
| 22. After several days of wear, my clothing must be cleaned.   | A B C D E |
| 23. I feel I must shower at least once a week.   | A B C D E |
| 24. Methods other than brushing are as effective in keeping the mouth "clean".                                   | A B C D E |
| 25. You can tell a lot about a person by his physical appearance.  | A B C D E |
| 26. I feel I should wash my hair approximately once a week.  | A B C D E |
| 27. Most body odor is offensive to me.   | A B C D E |
| 28. I feel I should manicure my fingernails about once every two weeks.  | A B C D E |

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REPUBLIC DIVISION

- |   |           |
|---|-----------|
| 29. I feel I should brush my teeth after every meal.  | A B C D E |
| 30. I enjoy being "clean" shaven.   | A B C D E |
| 31. If I do not wash my hair often enough, it becomes oily and uncomfortable.                           | A B C D E |
| 32. I enjoy wearing clothing that has been ironed.  | A B C D E |
| 33. I feel I must shower every day to be clean.   | A B C D E |
| 34. Brushing my teeth gives my mouth a "clean" feeling.   | A B C D E |
| 35. My physical appearance is important to me.  | A B C D E |
| 36. I would find a "wet" or "dry" (chemical) wash for my hair equally adequate over a long time period. | A B C D E |
| 37. I get cleaner when I take long showers.   | A B C D E |
| 38. Ragged fingernails are "uncomfortable".   | A B C D E |
| 39. I know when I have "bad breath" by how my mouth feels.  | A B C D E |
| 40. Stubble or a beard makes a person look "dirty".   | A B C D E |
| 41. If I do not wash my hair often enough, it begins to have an odor.                                   | A B C D E |
| 42. I cannot wear clothes that I believe are "dirty".   | A B C D E |
| 43. I know when I am dirty just by looking at the pores of my skin.                                     | A B C D E |
| 44. I feel I should brush my teeth at least every morning and every evening.                            | A B C D E |
| 45. An individual's physical appearance is extremely important.   | A B C D E |
| 46. I feel I should wash my hair approximately twice a week.  | A B C D E |
| 47. Long hot showers relax me.  | A B C D E |
| 48. I am uncomfortable by the feel of dirt under my fingernails.  | A B C D E |
| 49. I feel I should brush my teeth at least once a day.   | A B C D E |
| 50. I find shaving necessary.   | A B C D E |

The purpose of the second phase of this study is to measure the meanings of certain things to various people by having them judge them against a series of descriptive scales. In taking this test, please make your judgments on the basis of what these things mean to you. On each page of this booklet you will find a different concept to be judged and beneath it a set of scales. You are to rate the concept on each of these scales in order.

Here is how you are to use these scales:

If you feel that the concept at the top of the page is very closely related to one end of the scale, you should place your check-mark as follows:

fair X : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ unfair  
or  
fair \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : X unfair

If you feel that the concept is quite closely related to one or the other end of the scale (but not extremely), you should place your check-mark as follows:

strong \_\_\_\_ : X : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ weak  
or  
strong \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : X : \_\_\_\_ weak

If the concept seems only slightly related to one side as opposed to the other side (but is not really neutral), then you should check as follows:

active \_\_\_\_ : \_\_\_\_ : X : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ passive  
or  
active \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : X : \_\_\_\_ : \_\_\_\_ passive

The direction toward which you check, of course, depends upon which of the two ends of the scale seem most characteristic of the thing you're judging.

If you consider the concept to be neutral on the scale (both sides of the scale equally associated with the concept), or if the scale is completely irrelevant (unrelated to the concept), then you should place your check-mark in the middle space.

safe \_\_\_\_ : \_\_\_\_ : \_\_\_\_ : X : \_\_\_\_ : \_\_\_\_ : \_\_\_\_ dangerous



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REPUTATION RESEARCH

**IMPORTANT:**

- 1) Place your check-marks in the middle of spaces, not on the boundaries:

	This	Not This
_____:	_____:	_____:
	X	X

- 2) Be sure you check every scale for every concept; do not omit any.
- 3) Never put more than one check-mark on a single scale.

Sometimes you may feel as though you've had the same item before on the test. This will not be the case, so do not look back and forth through the items. Do not try to remember how you checked similar items earlier. Make each item a separate and independent judgment. Work at fairly high speed through this test. Do not worry or puzzle over individual items. It is your first impressions, the immediate "feelings" about the items that we want. On the other hand, please do not be careless because we want your true impressions.

1.

**BODY CLEANING USING TOWEL ONLY**

hot	_____	_____	_____	_____	_____	_____	cold
pleasant	_____	_____	_____	_____	_____	_____	unpleasant
tense	_____	_____	_____	_____	_____	_____	relaxed
hard	_____	_____	_____	_____	_____	_____	soft
fresh	_____	_____	_____	_____	_____	_____	stale
dirty	_____	_____	_____	_____	_____	_____	clean
sweet	_____	_____	_____	_____	_____	_____	sour
sick	_____	_____	_____	_____	_____	_____	healthy
bitter	_____	_____	_____	_____	_____	_____	sweet
pungent	_____	_____	_____	_____	_____	_____	bland
nice	_____	_____	_____	_____	_____	_____	awful
calming	_____	_____	_____	_____	_____	_____	exciting
bad	_____	_____	_____	_____	_____	_____	good
pleasing	_____	_____	_____	_____	_____	_____	annoying
strange	_____	_____	_____	_____	_____	_____	familiar

1.

**CLEANING TEETH WITH BRUSH ONLY**

hot \_\_\_\_\_ cold  
pleasant \_\_\_\_\_ unpleasant  
tense \_\_\_\_\_ relaxed  
hard \_\_\_\_\_ soft  
fresh \_\_\_\_\_ stale  
dirty \_\_\_\_\_ clean  
sweet \_\_\_\_\_ sour  
sick \_\_\_\_\_ healthy  
bitter \_\_\_\_\_ sweet  
pungent \_\_\_\_\_ bland  
nice \_\_\_\_\_ awful  
calming \_\_\_\_\_ exciting  
bad \_\_\_\_\_ good  
pleasing \_\_\_\_\_ annoying  
strange \_\_\_\_\_ familiar

1.

**WASH CLOTH**

hot	_____	cold
pleasant	_____	unpleasant
tense	_____	relaxed
hard	_____	soft
fresh	_____	stale
dirty	_____	clean
sweet	_____	sour
sick	_____	healthy
bitter	_____	sweet
pungent	_____	bland
nice	_____	awful
calming	_____	exciting
bad	_____	good
pleasing	_____	annoying
strange	_____	familiar

1.

**BODY CLEANING VIA A CHEMICAL WIP E**

hot \_\_\_\_\_ cold  
pleasant \_\_\_\_\_ unpleasant  
tense \_\_\_\_\_ relaxed  
hard \_\_\_\_\_ soft  
fresh \_\_\_\_\_ stale  
dirty \_\_\_\_\_ clean  
sweet \_\_\_\_\_ sour  
sick \_\_\_\_\_ healthy  
bitter \_\_\_\_\_ sweet  
pungent \_\_\_\_\_ bland  
nice \_\_\_\_\_ awful  
calming \_\_\_\_\_ exciting  
bad \_\_\_\_\_ good  
pleasing \_\_\_\_\_ annoying  
strange \_\_\_\_\_ familiar

1.

**WASHING TEETH WITH BRUSH AND TOOTHPASTE**

hot	_____	_____	_____	_____	_____	_____	cold
pleasant	_____	_____	_____	_____	_____	_____	unpleasant
tense	_____	_____	_____	_____	_____	_____	relaxed
hard	_____	_____	_____	_____	_____	_____	soft
fresh	_____	_____	_____	_____	_____	_____	stale
dirty	_____	_____	_____	_____	_____	_____	clean
sweet	_____	_____	_____	_____	_____	_____	sour
sick	_____	_____	_____	_____	_____	_____	healthy
bitter	_____	_____	_____	_____	_____	_____	sweet
pungent	_____	_____	_____	_____	_____	_____	bland
nice	_____	_____	_____	_____	_____	_____	awful
calming	_____	_____	_____	_____	_____	_____	exciting
bad	_____	_____	_____	_____	_____	_____	good
pleasing	_____	_____	_____	_____	_____	_____	annoying
strange	_____	_____	_____	_____	_____	_____	familiar

i.

**UNMANICURED NAILS**

hot	_____	_____	_____	_____	_____	_____	cold
pleasant	_____	_____	_____	_____	_____	_____	unpleasant
tense	_____	_____	_____	_____	_____	_____	relaxed
hard	_____	_____	_____	_____	_____	_____	soft
fresh	_____	_____	_____	_____	_____	_____	stale
dirty	_____	_____	_____	_____	_____	_____	clean
sweet	_____	_____	_____	_____	_____	_____	sour
sick	_____	_____	_____	_____	_____	_____	healthy
bitter	_____	_____	_____	_____	_____	_____	sweet
pungent	_____	_____	_____	_____	_____	_____	bland
nice	_____	_____	_____	_____	_____	_____	awful
calming	_____	_____	_____	_____	_____	_____	exciting
bad	_____	_____	_____	_____	_____	_____	good
pleasing	_____	_____	_____	_____	_____	_____	annoying
strange	_____	_____	_____	_____	_____	_____	familiar

**CLEANING TEETH WITH "CHEMICAL" INGESTIBLE PASTE**

hot \_\_\_\_\_ cold  
pleasant \_\_\_\_\_ unpleasant  
tense \_\_\_\_\_ relaxed  
hard \_\_\_\_\_ soft  
fresh \_\_\_\_\_ stale  
dirty \_\_\_\_\_ clean  
sweet \_\_\_\_\_ sour  
sick \_\_\_\_\_ healthy  
bitter \_\_\_\_\_ sweet  
pungent \_\_\_\_\_ bland  
nice \_\_\_\_\_ awful  
calming \_\_\_\_\_ exciting  
bad \_\_\_\_\_ good  
pleasing \_\_\_\_\_ annoying  
strange \_\_\_\_\_ familiar



1.

**BODY CLEANING VIA A SHOWER**

hot \_\_\_\_\_ cold  
pleasant \_\_\_\_\_ unpleasant  
tense \_\_\_\_\_ relaxed  
hard \_\_\_\_\_ soft  
fresh \_\_\_\_\_ stale  
dirty \_\_\_\_\_ clean  
sweet \_\_\_\_\_ sour  
sick \_\_\_\_\_ healthy  
bitter \_\_\_\_\_ sweet  
pungent \_\_\_\_\_ bland  
nice \_\_\_\_\_ awful  
calming \_\_\_\_\_ exciting  
bad \_\_\_\_\_ good  
pleasing \_\_\_\_\_ annoying  
strange \_\_\_\_\_ familiar

1.

**HAIR WASH WITH SOAP AND WATER**

hot	_____	cold
pleasant	_____	unpleasant
tense	_____	relaxed
hard	_____	soft
fresh	_____	stale
dirty	_____	clean
sweet	_____	sour
sick	_____	healthy
bitter	_____	sweet
pungent	_____	bland
nice	_____	awful
calming	_____	exciting
bad	_____	good
pleasing	_____	annoying
strange	_____	familiar

**MANICURED NAILS**

hot \_\_\_\_\_ cold  
pleasant \_\_\_\_\_ unpleasant  
tense \_\_\_\_\_ relaxed  
hard \_\_\_\_\_ soft  
fresh \_\_\_\_\_ stale  
dirty \_\_\_\_\_ clean  
sweet \_\_\_\_\_ sour  
sick \_\_\_\_\_ healthy  
bitter \_\_\_\_\_ sweet  
pungent \_\_\_\_\_ bland  
nice \_\_\_\_\_ awful  
calming \_\_\_\_\_ exciting  
bad \_\_\_\_\_ good  
pleasing \_\_\_\_\_ annoying  
strange \_\_\_\_\_ familiar

1.

**SHAVING WITH AN ELECTRIC RAZOR**

hot	_____	_____	_____	_____	_____	_____	cold
pleasant	_____	_____	_____	_____	_____	_____	unpleasant
tense	_____	_____	_____	_____	_____	_____	relaxed
hard	_____	_____	_____	_____	_____	_____	soft
fresh	_____	_____	_____	_____	_____	_____	stale
dirty	_____	_____	_____	_____	_____	_____	clean
sweet	_____	_____	_____	_____	_____	_____	sour
sick	_____	_____	_____	_____	_____	_____	healthy
bitter	_____	_____	_____	_____	_____	_____	sweet
pungent	_____	_____	_____	_____	_____	_____	bland
nice	_____	_____	_____	_____	_____	_____	awful
calming	_____	_____	_____	_____	_____	_____	exciting
bad	_____	_____	_____	_____	_____	_____	good
pleasing	_____	_____	_____	_____	_____	_____	annoying
strange	_____	_____	_____	_____	_____	_____	familiar

1.

### SHAVING WITH A MANUAL RAZOR

hot \_\_\_\_\_ cold  
pleasant \_\_\_\_\_ unpleasant  
tense \_\_\_\_\_ relaxed  
hard \_\_\_\_\_ soft  
fresh \_\_\_\_\_ stale  
dirty \_\_\_\_\_ clean  
sweet \_\_\_\_\_ sour  
sick \_\_\_\_\_ healthy  
bitter \_\_\_\_\_ sweet  
pungent \_\_\_\_\_ bland  
nice \_\_\_\_\_ awful  
calming \_\_\_\_\_ exciting  
bad \_\_\_\_\_ good  
pleasing \_\_\_\_\_ annoying  
strange \_\_\_\_\_ familiar

**INSTRUCTIONS:**

On the following pages you will find a listing of those items that you may have used or are related to personal hygiene. The list is repeated three times. Please complete the questions that concern your use of the item in the following manner:

List 1 - To be completed as if you were in the chamber one week.

List 2 - To be completed as if you were in the chamber 4 weeks.

List 3 - To be completed as if you had just completed 8 full weeks  
in the chamber

You will notice that after each item there are 5 columns, labeled 1 - 5. For each item on the list describe your level of satisfaction with the item. The scoring of each item is:

- 1 - Very Unsatisfactory
- 2 - Unsatisfactory
- 3 - Neutral
- 4 - Satisfactory
- 5 - Very Satisfactory

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REPUBLIC DIVISION

List 1

<u>Item</u>	SCORING				
	1	2	3	4	5
	Very Un- Satisfactory	Unsatisfactory	Neutral	Satisfactory	Very Satis- factory
1. Garment, C.W.	_____	_____	_____	_____	_____
2. Sheets	_____	_____	_____	_____	_____
3. Blankets	_____	_____	_____	_____	_____
4. Trash bags, lge	_____	_____	_____	_____	_____
5. Towels	_____	_____	_____	_____	_____
6. Wash Cloths	_____	_____	_____	_____	_____
7. Towel PBI	_____	_____	_____	_____	_____
8. Wash Cloth PBI	_____	_____	_____	_____	_____
9. Shower	_____	_____	_____	_____	_____
10. Biocide Pads	_____	_____	_____	_____	_____
11. G.P. Tissues	_____	_____	_____	_____	_____
12. Utility Wipes	_____	_____	_____	_____	_____
13. Bar Soap	_____	_____	_____	_____	_____
14. Liquid Soap	_____	_____	_____	_____	_____
15. Wet Wipes	_____	_____	_____	_____	_____
16. Skin Emollient	_____	_____	_____	_____	_____
17. Shave Cream	_____	_____	_____	_____	_____
18. Razor	_____	_____	_____	_____	_____
19. Hair Brush	_____	_____	_____	_____	_____
20. Dental Floss	_____	_____	_____	_____	_____
21. Toothbrush	_____	_____	_____	_____	_____
22. Toothpaste	_____	_____	_____	_____	_____
23. Styptic Pencil	_____	_____	_____	_____	_____

List 1 .

Item	SCORING				
	1 Very Un- Satisfactory	2 Unsatisfactory	3 Neutral	4 Satisfactory	5 Very Satis- factory
24. Nail Clippers	_____	_____	_____	_____	_____
25. Hair Trimmer	_____	_____	_____	_____	_____
26. Shampoo	_____	_____	_____	_____	_____
27. Mirror	_____	_____	_____	_____	_____
28. Shower Water Temp.	_____	_____	_____	_____	_____
29. Shower Water Amount	_____	_____	_____	_____	_____
30. Air Cleanliness	_____	_____	_____	_____	_____



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List 2.

<u>Item</u>	SCORING				
	1 Very Un- Satisfactory	2 Unsatisfactory	3 Neutral	4 Satisfactory	5 Very Satis- factory
1. Garment, C.W.	_____	_____	_____	_____	_____
2. Sheets	_____	_____	_____	_____	_____
3. Blankets	_____	_____	_____	_____	_____
4. Trash bags, lge	_____	_____	_____	_____	_____
5. Towels	_____	_____	_____	_____	_____
6. Wash Cloths	_____	_____	_____	_____	_____
7. Towel PBI	_____	_____	_____	_____	_____
8. Wash Cloth PBI	_____	_____	_____	_____	_____
9. Shower	_____	_____	_____	_____	_____
10. Biocide Pads	_____	_____	_____	_____	_____
11. G.P. Tissues	_____	_____	_____	_____	_____
12. Utility Wipes	_____	_____	_____	_____	_____
13. Bar Soap	_____	_____	_____	_____	_____
14. Liquid Soap	_____	_____	_____	_____	_____
15. Wet Wipes	_____	_____	_____	_____	_____
16. Skin Emollient	_____	_____	_____	_____	_____
17. Shave Cream	_____	_____	_____	_____	_____
18. Razor	_____	_____	_____	_____	_____
19. Hair Brush	_____	_____	_____	_____	_____
20. Dental Floss	_____	_____	_____	_____	_____
21. Toothbrush	_____	_____	_____	_____	_____
22. Toothpaste	_____	_____	_____	_____	_____
23. Styptic Pencil	_____	_____	_____	_____	_____

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List 2

Item	SCORING				
	1 Very Un- Satisfactory	2 Unsatisfactory	3 Neutral	4 Satisfactory	5 Very Satis- factory
24. Nail Clippers	_____	_____	_____	_____	_____
25. Hair Trimmer	_____	_____	_____	_____	_____
26. Shampoo	_____	_____	_____	_____	_____
27. Mirror	_____	_____	_____	_____	_____
28. Shower Water Temp.	_____	_____	_____	_____	_____
29. Shower Water Amount	_____	_____	_____	_____	_____
30. Air Cleanliness	_____	_____	_____	_____	_____

List 3

<u>Item</u>	SCORING				
	1 Very Un- Satisfactory	2 Unsatisfactory	3 Neutral	4 Satisfactory	5 Very Satis- factory
1. Garment, C.W.	_____	_____	_____	_____	_____
2. Sheets	_____	_____	_____	_____	_____
3. Blankets	_____	_____	_____	_____	_____
4. Trash bags, lge	_____	_____	_____	_____	_____
5. Towels	_____	_____	_____	_____	_____
6. Wash Cloths	_____	_____	_____	_____	_____
7. Towel PBI	_____	_____	_____	_____	_____
8. Wash Cloth PBI	_____	_____	_____	_____	_____
9. Shower	_____	_____	_____	_____	_____
10. Biocide Pads	_____	_____	_____	_____	_____
11. G.P. Tissues	_____	_____	_____	_____	_____
12. Utility Wipes	_____	_____	_____	_____	_____
13. Bar Soap	_____	_____	_____	_____	_____
14. Liquid Soap	_____	_____	_____	_____	_____
15. Wet Wipes	_____	_____	_____	_____	_____
16. Skin Emollient	_____	_____	_____	_____	_____
17. Shave Cream	_____	_____	_____	_____	_____
18. Razor	_____	_____	_____	_____	_____
19. Hair Brush	_____	_____	_____	_____	_____
20. Dental Floss	_____	_____	_____	_____	_____
21. Toothbrush	_____	_____	_____	_____	_____
22. Toothpaste	_____	_____	_____	_____	_____
23. Styptic Pencil	_____	_____	_____	_____	_____

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List 3

Item	SCORING				
	1 Very Un- Satisfactory	2 Unsatisfactory	3 Neutral	4 Satisfactory	5 Very Satis- factory
24. Nail Clippers	_____	_____	_____	_____	_____
25. Hair Trimmer	_____	_____	_____	_____	_____
26. Shampoo	_____	_____	_____	_____	_____
27. Mirror	_____	_____	_____	_____	_____
28. Shower Water Temp.	_____	_____	_____	_____	_____
29. Shower Water Amount	_____	_____	_____	_____	_____
30. Air Cleanliness	_____	_____	_____	_____	_____

In the space provided, you are free to make any comments you consider relevant to the personal hygiene aspects of the confinement period. Consideration should be given to the hardware present, availability of required items, absence of item(s) considered desirable.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

In the space provided, you are free to make any comments you consider relevant to the personal hygiene aspects of the confinement period. Consideration should be given to the hardware present, availability of required items, absence of item(s) considered desirable.

Name: \_\_\_\_\_

Date: \_\_\_\_\_